ARBAMINCH UNIVERSITY INSTITUTE OF TECHNOLODGY DEPARTMENT OF CIVIL ENGINERING

Holistic questions for fourth year civil engineering students (2010/2011)

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1. For a hollow and solid structural members of equivalent cross sectional area. Which one is more efficient under torsion? Discuss briefly.
2. Sketch the typical stress –strain diagram of ductile and brittle materials.
3. A short structural member of length L, area A, and modulus of elasticity E is subjected to a compressive load of P, what is the type and magnitude of deformation that will occur on the structure?
4. If a simple beam of span L is subjected to a triangular load beginning at zero from the left support to a value at the right support, determine the location of the maximum bending moment.
5. Discuss briefly statically determinate and statically indeterminate beams and the methods used to calculate the deformations of those beams.
6. Discuss thermal stress, strain, and deformation due to it.
7. Show that the distribution of shear stress in rectangular beam is parabolic.
8. Discuss briefly the following terms
    a) Elastic range of the stress-strain diagram
    b) Plastic range of the stress-strain diagram and
    c) Strain hardening range of the stress-strain diagram
9. Discuss stress and its types, strain and elasticity.
10. When reinforced concrete elements are used, sufficient bond between steel and concrete must be developed to ensure that there no relative movements between the steel bars and the surrounding concrete. Discusses the mechanism that the bond can be developed.
11. Compare and contrast the different types of design philosophies.
12. How can we assure ductility failures during the design
13. Reinforcing bars are as by fabrication limited in length, the standard length one reinforcing bar is 12 m. Thus it is normal to splice bars in the field. Discuses the location of positive and negative bars splice can be made.
14. Discuss the purpose of concrete cover for hollow and solid structural members of equivalent cross sectional area. Which one is more efficient under torsion? Discuss briefly.
15. Sketch the typical stress –strain diagram of ductile and brittle materials.
16. A short structural member of length L, area A, and modulus of elasticity E is subjected to a compressive load of P, what is the type and magnitude of deformation that will occur on the structure?
17. If a simple beam of span L is subjected to a triangular load beginning at zero from the left support to a value at the right support, determine the location of the maximum bending moment.
18. Discuss briefly statically determinate and statically indeterminate beams and the methods used to calculate the deformations of those beams.

19. Discuss thermal stress, strain, and deformation due to it.
20. Show that the distribution of shear stress in rectangular beam is parabolic.

21. Discuss briefly the following terms
    a) Elastic range of the stress-strain diagram
    b) Plastic range of the stress-strain diagram and
    c) Strain hardening range of the stress-strain diagram
22. Discuss stress and its types, strain and elasticity.
23. When reinforced concrete elements are used, sufficient bond between steel and concrete must be developed to ensure that there no relative movements between the steel bars and the surrounding concrete. Discusses the mechanism that the bond can be developed.
24. Compare and contrast the different types of design philosophies.
25. How can we assure ductility failures during the design
26. Explain the difference in appearance of flexural crack, shear crack, torsion crack and bond failure crack.
27. Why are deflection limits in design?
28. What factors affect the buckling resistance of axially loaded column?
29. Explain the meaning of over-reinforced beam and under-reinforced beam.
30. Give three reasons for the minimum cover requirement according to EBCS-2. Under what circumstance are greater cover are used.
31. Give two reasons for the minimum bar spacing according to EBCS-2.
32. Explain why the torsion the edge A-B in fig.1 is called equilibrium torsion while the torsion the edge A1-B1 in fig.2 is called compatibility torsion.

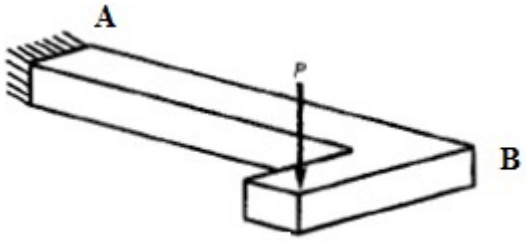

Fig.1

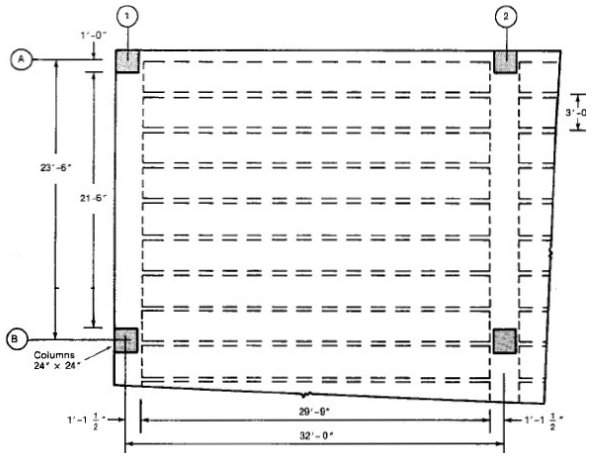

Fig.2

33. Discuss the types of steel cross sections according to EBCS-3 classification.

34. Discuss the type of failure modes for the following axially loaded compression columns,
    a) For short column
    b) For medium column
    c) For slender column
35. Differentiate between local buckling and overall flexural buckling for axially loaded compression members
36. What does it mean by Euler buckling load.
37. Discuss lateral torsion failures of beam.
38. How a soil can be identified whether it is sand, silt or clay on a project site? Describe just two tests, in short.
39. A project site consists of expansive soil. How you will identify it on the site if you are the project manager.
40. What tests are conducted to control the field density when an earth embankment is under construction? Describe in short.
41. Which of the properties of a soil is most important while dewatering a construction site? Just describe it.
42. Which laboratory test should be conducted to determine the building settlement when it rests in saturated clayey soil? Describe in short.
43. In a geotechnical investigation report, the soil is described as:
    GS, WS, MC, CS-MS
44. Describe what these symbols indicate.

45. Which soil consists of fibrous texture? Write two other properties of such soils.
46. A site consists of gravelly sand. Which test should be conducted to determine the in-situ density? Describe in short.
47. What apparatus should be used to locate the underground water table? Sketch.
48. How will you theoretically determine the seepage under a dam? Describe in short.
49. What are the parameters to describe the shear strength of sand and clay? Describe.
50. What soil property is prominent in the stability of a slope? Describe.
51. According to the drainage conditions, what are the various tests that can be conducted in the tri axial test apparatus? Describe in short.
52. What type of earth pressure is developed if the retaining wall moves a) away from the backfill, b) towards the backfill and c) does not move at all. Describe with proper reasons.
53. Which soil is considered to be most appropriate for backfill and why? Give reasons.
54. Describe the various situations in which a retaining wall can be provided on a building project. Draw suitable sketches while explaining.
55. Describe difference between compaction and consolidation, with suitable example.
56. Draw the various types of retaining walls with approximate dimensions.
57. How will you differentiate normally consolidated and over-consolidated soils? Describe in short.
58. Which method you prefer to determine the earth pressure behind a retaining wall- Rankin or Coulomb and why?
59. Show in neat sketches the reinforcement in a) square footing, b) wall footing and c) rectangular footings.
60. Why the cover to the reinforcement in footing is provided? Give reasons.
61. How much should the cover be provided in foundation if the environmental conditions i) non-aggressive, ii) aggressive elements in soil and ground water.
62. What should be the nominal cover if the footing is casted i) directly on the soil and ii) on the leveling course?
63. Are dowels bars provided in the foundations? Mention their diameters and lengths, just in a sketch or two.
64. What is function of the dowel bars in a foundation? Show a foundation with dowel bars in a sketch.
65. Mention the concrete mixes used in foundations. Describe the batching of various concrete mixes as done at the construction site.
66. Draw the plan and section of combined rectangular with bottom and top reinforcement.
67. What is anchorage length in a footing? Explain it with neat sketch.
68. Show in a neat sketch, the reinforcement in a cantilever retaining wall.
69. State things should be considered during route selection.
70. Suppose you may be assigned to analysis the traffic data for a newly selected route where there is no any traffic data is collected and documented before. Therefore, state the most probable factors that may help you for predicting the initial input traffic data.

71. Draw a typical cross section which taken from cut location and discuss all the cross-section elements.
72. List different types of horizontal curves and discuss their difference clearly.
73. State certain guidelines that must be borne in mind in selecting the alignment and locating the route.
74. What is meant by super elevation? Where and why we provided it?
75. It is mandatory to pass the route though a flat terrain where the surface water is highly suspected on the month of June to October. In addition to this, the soil survey result shows the existing soil type is highly organic and the selected materials are abundant in the vicinity at a distance of 4km.Therefore, discuss the methods of construction through such type condition and show sample cross-section of the area.
76. Discuss clearly the information you may obtain from the highway cross-section and mass diagram during the construction phase. And using an assumed natural profile and corresponding grade of a road of your own choice plot and discuss on the concepts of the mass diagram.
77. What major do you take if the minimum criteria for the stopping sight distance are not satisfied on the crest vertical curve?
78. Rearrange the following activities based on their sequence of construction.
    Earth work
    Route selection
    Pavement works
    Structure works
    Reconnaissance survey.
79. State the application of the following surfacing materials clearly.
    Cold mix
    Hot mix
    Treatment
    Granular surfacing
80. Discuss reasons for soil stabilization and its mechanism.
81. What is the objective of providing camber/cross-slope in road design? Discuss the factors on which the amount of camber to be provided depends. For which type of pavement, asphalt or gravel, do you recommend a greater value of camber?
82. Write methods of determining the average daily traffic volume (ADT) during the upgrading of the existing pavement.
83. What is meant by paved and unpaved pavement? How to distinguish them?
84. Draw a neat label cross section of hill road partly in cutting and partly in embankment.
85. Draw regulatory sign for speed limits, weight limits, no parking, overtaking prohibited.
86. State the basic difference of ERA and AASHTO pavement design manual.
87. List different types of bituminous that are commonly used on pavement construction in Ethiopia.
88. Discuss the basic difference of rigid and flexible pavement.

89. According to ERA manual, what is the maximum length of straights and the minimum length of straight between circular curves turning in the same direction with respect to the design speed?
90. Explain the factors which control the selection of contour interval.